Emergent analogical reasoning in large language models

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Abstract

The recent advent of large language models has reinvigorated debate over whether human cognitive capacities might emerge in such generic models given sufficient training data. Of particular interest is the ability of these models to reason about novel problems zero-shot, without any direct training. In human cognition, this capacity is closely tied to an ability to reason by analogy. Here we performed a direct comparison between human reasoners and a large language model (the text-davinci-003 variant of Generative Pre-trained Transformer (GPT)-3) on a range of analogical tasks, including a non-visual matrix reasoning task based on the rule structure of Raven's Standard Progressive Matrices. We found that GPT-3 displayed a surprisingly strong capacity for abstract pattern induction, matching or even surpassing human capabilities in most settings; preliminary tests of GPT-4 indicated even better performance. Our results indicate that large language models such as GPT-3 have acquired an emergent ability to find zero-shot solutions to a broad range of analogy problems. Webb et al. show that new artificial intelligence language models, such as Generative Pre-trained Transformer 3, are able to solve analogical reasoning problems at a human-like level of performance.